0020012.P001

UNITED STATES PATENT APPLICATION
FOR

GOLF PUTTER

INVENTOR:

Ronald E. Griffin

Prepared By:

Theresia C. Sandhu
Patent Bar # 44315

955 Woodgrove Lane
San Jose, California 95136

(408) 269-7258

GOLF PUTTER

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/226,300, filed August 21, 2000.

FIELD OF THE INVENTION

The present invention relates to the field of sports equipment used in the game of golf, more particularly to a golf putter with an improved putter face, alignment means, doze, sole and its preferred embodiments.

BACKGROUND OF THE INVENTION

The object of the sport of golf is to attain a score of "Par", a 72-stroke standard over a typical course where there are 18 individual fairways or "holes" to be played. In order to score well on each hole, when beginning the series of strokes designed to move the ball from the tee to the hole or cup into which the ball must be dropped, a golfer must first strike the ball with a golf club called a wood, designed to hit the ball as straight and long as possible or a golf club called an iron to attain distance and achieve control over the ball as it lands on the designated green area surrounding the hole. The object of the game is to move the ball from the initial teeing off position of each hole to the designated green area of each hole in as few strokes as possible. Once the ball lands on the green, an area of short well-cut grass forming a uniform surface, the golfer uses a putter to move the ball towards and into the hole itself.

While golf courses vary in design, most follow a standard configuration of four par 5 holes, ten par 4 holes, and four par 3 holes. To maintain a uniform scoring system the game allows for 2 strokes per hole using a club called a putter to finally drop the golf ball into a cup 4 ¼ inches in diameter, partially buried in the earth. The current scoring standard for a par 72 game calls for 36 putts and 36 of all other shots. Improving the function of the putter and achieving a precise execution of putting skills is essential to developing a winning scoring strategy. Optimization of the putter

and putting skills is as essential as the optimization of all other clubs and skills combined. It is to that end that the golf putter herein described has been invented.

A putter is composed of a shaft upon which is mounted a handle at the uppermost end and a putter head on the lowermost end which comes in actual contact with the ball. The shaft may be attached to the putter head on its uppermost surface either in the center between the two ends or at some point nearer one of the ends. To be tournament legal, the putter face must have a length in the direction horizontal to the ground longer than its vertical height; It must have a continuous face, and the angle at which the shaft joins the head must be no less than 10 degrees off the vertical. The angle of the shaft requires the golfer to position his body close to the grip ostensibly to be in a position to better align the putter with the ball, to position the putter so that the surface of the putter contacts the ball at the desired location and to accurately determine the direction of travel required to reach the hole. The resultant crowded, hunched position of the golfer inhibits the pendulum like swing of the ideal putting stroke.

The present invention includes a shaft that extends rigidly from the putter head at an angle greater than 10 degrees from the vertical. This allows the golfer more freedom to execute a pendulum swing which is more likely to result in a controlled contact with the ball. The guide contours described below enable the golfer to align the ball with the optimum striking surface, allowing him or her to view the guidelines and ball from a position directly above the ball.

The ball will travel in a direction perpendicular to the face of the putter at the moment the face of the putter strikes the ball. Therefore it is desirable that the putter face be perpendicular to the direction that the ball must travel in order to arrive at the hole. If the putter face is not perpendicular to this direction, the ball will not arrive at the hole and extra strokes will be required to make the ball fall into the hole.

Commonly, the golfer is required to grasp the putter firmly to assure that the ends of the putter do not move off the plane perpendicular to the ball's direction of travel. During the pendulum swing of the putt, the golfer must be careful to hold the grip rigidly to avoid twisting the grip with resultant movement of the putter head to an angle off the perpendicular to the ball's desired direction of travel. During the pendulum swing of the putt, the golfer must exert excess torque on the grip to maintain the putter head in the desired position. In order to achieve the desired putt, the golfer must be practiced in exerting the proper amount of torque to compensate for the putter's tendency to rotate or twist during the swing.

During the swing of the putt, the head of a face balanced, or "dynamically" balanced putter remains perpendicular to the desired direction of travel of the ball and parallel to the ground. Thus the golfer does not have to exert torque on the grip to maintain the putter head in the desired position.

U.S. Patent No. 3,625,984 to Solheim discloses his solution to minimizing twist during the swing. He distributes the weight of the putter head in the heel and toe sections. Further, U.S. Patent No. 5,913,731 to Westerman provides a face balance by offsetting the shaft from the center of the putter head and including a double bend in the shaft. This distribution of weight and offsetting of the shaft from the center of the putter head results in a dulling of the sensation when kinetic energy is imparted to the ball as it is hit. The golfer experiences a reduced "touch" and "feel" and is not able to effectively judge how much force has been applied to the ball because he cannot "feel" the impact.

The putter head of the present invention has mass concentrated near the shaft at the center of the putter head behind the impact zone of the putter head face. This weight distribution results in a better release of the kinetic energy of the swing to the ball. In the preferred embodiment, the shaft is inserted into the putter head at the center of the putter head. Thus, the axis of the putter shaft extends through the center of the putter head, resulting in a static balance where the head of the putter assumes a

position vertical to the plane of the ground when the putter is balanced at a point along its shaft. Normally, a statically balanced putter exhibits a tendency to twist or rotate during the pendulum swing. However, in the present invention, the concentration of weight in the center of the putter head along the axis of the shaft effectively limits twist which would result if the weight of the putter head were evenly distributed along the length of the putter head or concentrated in the toe and heel. The putter's balance is laterally extended from the center of mass outwardly to promote a pendulum like swing increasing the chances of the front face remaining parallel with the ground and perpendicular to the target while moving through the putting stroke

Further, the advantage of the putter head weight being concentrated at the center near the shaft rather than distributed along the length of the putter head or concentrated at the opposing ends of the putter head is that there is greater feed back up the shaft (i.e. the golfer is better able to feel the impact of the putter head against the ball and consequently control the force used to propel the ball towards the hole.) The head weight is distributed by forming a cavity behind the heel and toe causing the center of gravity of the putter head to rise from the bottom portion of the putter head to the optimum strike area. Positioning the weight increasingly up toward the middle and centering the majority of the mass directly behind the optimum strike area creates a dense and powerful "sweet spot", allowing the user to use shorter and more compact strokes for more consistent distance control and a decrease of the human error factor.

U.S. Patent 1, 525,137 to Lawton teaches "flexibility of the hosel" with the objective to make the shank more flexible, avoid crowding of the ball and the resultant checking of the ball's movement. The putter of present invention has no hosel and the head is rigidly attached to the shaft to decrease lateral rotation and impart greater control over the speed and direction of the golf ball.

Further, it is desirable that the putter approach the ball while grazing the surface of the green and contact the ball at a point on the equator of the ball, a point along the

circumference of the ball that is equidistant from the top and the bottom of the ball as it rests on the surface of the green. In reality, most golfers will not strike the ball with the putter in the ideal position, resting on the surface of the green, but will strike the ball with the putter at some variable distance above the surface of the green resulting in the putter hitting the ball at some unknown point either above or below the equator. Hitting the ball above the equator results in imparting an undesirable spin to the ball and driving the ball into the ground which causes the ball to bounce uncontrollably. Striking the ball at a point below the equator results in a lofting or lifting of the ball and a subsequent loss of control.

It is desirable to impart a slight forward or "over" spin to the ball. This results in the ball hugging the ground without bouncing or skipping. U.S. patent No. 1,525,137 issued to Lawton describes a desire to "avoid crowding the ball toward the ground". However, U.S. Patent 4, 881,739 to Garcia points out that "a preferred putter would propel the golf ball forward with overspin in order to create greater control between the putter face, the golf ball and the putting surface." An overspin results when the putter surface hits the surface of the ball at a one degree angle forward from the perpendicular. The putter of present invention imparts over spin in order to create improved control of the putter face, the golf ball, and the putting surface.

U.S. Patent 4,881,739 to Garcia discloses a putter which has a radius of curvature of the ball striking face of about between 0.84 and 1.12 inches. Both the horizontal plane and the ball striking face are located essentially 0.84 inches from the sole. The strike point of the Garcia putter is ideally at the intersection of the horizontal plane and the radius of curvature of the ball striking face. This design accomplishes two objectives, namely 1 – to impart an overspin to the ball and 2 - to eliminate the possibility of lofting the ball. Garcia further points out that regardless of whether the putter hits the ball while grazing the ground or while at some distance from the ground, the curvature of the striking face renders lofting impossible.

However, Garcia assumes that golfers will use a "preferred putting stroke". This assumption overlooks the possibility that the golfer may swing the putter so that at the point of impact, the shaft is at a forward angle rather than perpendicular to or at an obtuse angle to the ground. If the shaft is at a forward angle to the ground, the beveled edge may contact the ball with uncertain results.

Further, Garcia does not consider that the ideal forward motion of the ball includes not only an overspin but a one degree loft. An ideal loft is imparted by where the ball is struck by a putter surface that is one degree off the perpendicular. The putting head surface in Garcia invention is merely defined by a radius similar to the radius of the golf ball.

The present invention comprises a putting head surface with a non radial curvature which results in a striking surface that is approximately a one to 3 degree deviation from the perpendicular regardless of what part of the putter head actually impacts the ball.

Many commercially available golf putters including Ping ™, Oddessy ™ and Callaway ™ address the problem of imparting a loft by having a putter head surface which is three to five degrees forward off the perpendicular when the shaft is held perpendicularly to the ground. Unfortunately, if the putter head strikes the ball surface at the equator while the shaft is perpendicular to the ground, the ideal overspin and loft would not be realized. This requires the golfer to hold the putter in such a manner as to deloft the putter to maintain the position of the head vertical to the ground. This presumes that the golfer strikes the ball with the putter shaft at a position nearly vertical to the ground. However, most golfers strike the ball at an angle greater than one degree forward, imparting an excessive overspin resulting in a bounce, or an angle greater than one degree backward resulting in an uncontrollable lofting of the ball.

U.S. patent No. 1,525,137 issued to Lawton which describes a putter with a curved, cylindrical face wherein the contact point between the club and the ball is above the center of the ball. The putter of present invention to strikes the ball at the preferred 1 degree of loft at the point of contact whether above, below or at the equator of the ball. Lawton further discloses a convex striking face curving upwardly and backwardly in order to impart an overspin to the ball. The Lawton putter does nothing to impart a loft to the ball, a loft which compensates for excessive overspin and helps to avoid driving the ball into the ground.

U. S. patent No 5,683,307 issued to Guerin D. Rife discloses a weight distribution formed by a cavity in the upper surface whereby the predominance of the weight of the head is at the heel, the toe and bottom portions of the putter. This bottom weight configuration is combined with a ball striking face having a loft no greater than three degrees. The weight distribution, acting to lift the ball when it is struck, eliminates the need for a more lofted ball striking face. The purpose of the lofted face is to maintain the golf ball closer to the ground immediately after impact.

The obvious drawback to the lofted face is that it creates "skid" or "slide" which is the initial travel of the golf ball prior to the moment when the friction from the putting surfaces forces the golf ball to begin its forward roll toward the golf hole. The bottom weight configuration contributes to excessive slide.

The present invention has a center of mass located above the bottom immediately behind the "sweet spot" or preferred area of impact on the striking surface along the longitudinal axis of the shaft. The location of the putter's center of mass enables a pendulum like swing and contributes to an increased ability of the golfer to fell the ball and sense the precise amount of force required to impel the ball toward the target. The striking face of the present invention imparts a desirable one-degree loft to the ball regardless of where on the putter head striking surface impact is made.

U. S. patent No 4, 077,633 issued to Mr. George Studen discloses a golf ball striking face on the head "being" divided into two contiguous transverse face segments, the lower of which is slanted downwardly and backward at about 1-7 degrees, and the upper of which is slanted upwardly and backward at about: 1-3 degrees. It further envisions a non-planar, obtuse angle configuration for the ball striking face and the contact being envisioned preferably along the intersection between two contiguous transverse face segments mentioned. The problem with this invention is that is assumes once again that the putter head is grazing the ground and that the shaft is vertical to the ground when the ball is impacted. Studen attempts to compensate for an imperfect position of the shaft and height of the putter off the ground by introducing angles to the face of the putter. However if the ball is hit on the follow through of the stroke by the lower transverse segment, a likely scenario since the putter will be rising up from the ground, the angle of the putter off the vertical at impact will be close to zero.

The assumption implicit in the design of a putter having a face of one degree off the perpendicular is that the putter is striking the ball when the sole of the putter is grazing the ground. Most golfers do not know or understand how high their putter is from the ground at the moment of impact with the ball. Professional golfers correct for variances in the height of their putter from the ground by holding the shaft in a position known as delofting to result in the ball being hit at a one-degree angle off the perpendicular. This favorable or preferred stroke results in the ball being hit at a one-degree angle. The success of this depends heavily on the experience and skill of the golfer. This method is unreliable for the average golfer.

The present invention solves the problem of imparting a one degree loft and a controllable overspin to the ball by providing a novel striking surface which impacts the ball at a one degree angle off the perpendicular throughout an expanded strike zone or "sweet spot". The striking surface of the preferred embodiment is defined by a closed plane curvature generated by a point moving in such a way that the sums of its distances from two fixed points is a constant. The new striking surface of the

present invention begins with a 1-degree non-radial contour in the optimum-striking center in the middle of the striking surface. A non-radial striking face is created by using the equivalent of a finite element grid specified to reshape the striking surface at 1/10-inch increments and recalculate the surface contour to allow its user a 1-degree ball strike when the ball is impacted at any point on the putter head striking surface. This provides a tangible "forgiveness" for those less skilled in the art of putting. Thus, if the golfer strikes the ball with the shaft angled forward or angled back from the striking point, or with the putter head at a varying distance from the ground, the ball will attain the desired overspin and loft. The present invention compensates for unfavorable strokes, correcting for under and over striking through the use of a novel surface curvature.

Putters in use up to this time have proven themselves useful for professional players or those well practiced in the art of putting. Unfortunately one needs to work for years to perfect the skills necessary to use these clubs in such a manner as to attain preferred results

Without the years of practice it takes to perfect a pendulum like swing or the hours of lessons to required to attain the skills needed to deloft putters common in the art and strike the ball at the preferred 1 degree loft most golfers have fallen far short of the "Par" standard. In fact 85% of golfers have attested scores above 85 strokes. Hence golfers have an immediate need for a new golf putter.

Although pre-existing putter advances are noteworthy to one extent or another, none have achieved the object of an effective, efficient, and economical putter head, which always imparts a preferred forward motion with overspin to a golf ball.

Various devices have been used to provide the golfer with a means to line the putter up with the ball so that the ball is struck in the sweet spot of the putter strike face.

US Patent No. 4,077,633 to Studen, U.S. Patent No 5,916,035 to Calozzo, U.S. Patent No. 5,921,871 to Fisher, US Patent No. 5,913,731 to Westerman all disclose alignment mechanisms on the upper surface of the putter head consisting of either a single line (Westerman and Fisher), straight parallel lines delineating a line of sight (Calozzo) or parallel lines perpendicular to the line of sight (Studen). The lines either extend or are repeated across a length of the putter head corresponding to the diameter of the golf ball. The lines may terminate at the edge of the putter head or may be truncated to form a semicircle roughly conforming to the curvature of the circumference of the golf ball. The golfer is forced to project the lines and estimate where the edges of the golf ball will line up with the parallel lines' edges.

The alignment means of the preferred embodiment of the present invention is a pair of lines on the top surface of the putter head forming a semicircle, the curvature of which corresponds to the circumference of a golf ball. The center of the semicircle is at a point on the top surface directly above the desired strike point, extending from the forward edge of the putter head towards the rear of the putter head. The lines may be engraved on or form depressions in the surface of the putter head. The lines may be colored so that they contrast with the color of the putter head itself. The advantage of having circular lines corresponding to the circumference of the golf ball is that the golfer may make a quick check of the hand positioning while using the circular lines as a precise guide for proper sight alignment because the golfer's eye flows naturally from the extended edges of the curved lines to the ball itself much as a cupped catcher's mitt enables the catcher to envision where the ball will land and line up his mitt accordingly.

Putters common in the art are designed to have a wide sole. This provides a surface upon which the putter may rest and slide upon the ground, giving the golfer a means of aligning the putter so that the putter head sweet spot meets with the ball at the equator of the ball. The implicit assumption is that the ground or green along which the putter glides is smooth, having no friction. In reality, putters are also used along the fringes of the putting green where the grass is not well manicured or smooth.

Further, the putting green itself may be wet or un-manicured. The resultant friction between the putter sole and the surface of the ground creates a drag that interferes with the smooth execution of the putt and results in loss of control during the putt.

The preferred embodiment of the present invention solves this problem by limiting the width of the sole across the transverse portion of the putter head. The head forms a narrow sole to decrease drag allowing a smoother juncture between the earth, the grass and the putter. In addition, the sharp edged rearward angle extending rearwardly from the sole forms a doze to brush back the taller grass, increasing the odds of making putts launched from less manicured greens or from the fringe areas surrounding the green.

As illustrated by the great number of prior patents as well as commercial devices, efforts are continuously being made in an attempt to improve putters to render them more efficient, effective and economical. None of these previous efforts, however, provides the benefits of touch, accuracy and control of trajectory attendant with the present invention. Additionally, putters and putter heads common in the art do not suggest the present inventive combination of component elements arranged and configured as disclosed and claimed herein.

The present invention achieves its intended purposes, objects and advantages over the putters known in the art through a new, useful and non-obvious combination of component elements, with the use of a minimum number of functioning parts, at a reasonable cost to manufacture and by employing readily available materials.

OBJECTS OF THE INVENTION

It is an object of this invention to provide an improved putter for use during tournament play in the sport of golf having a head that achieves compliance with the rules of golf as promulgated by the USGA.

Another object of the present invention is to provide a golf putter including a head having a continuous face that measures no wider than its longest length attached to a shaft at greater than a 10 degree angle with the remainder of the shaft covered by a grip.

Another object of the present invention is to provide a golf putter head including a body having the quantity and location of mass in conjunction with shape to enhance the ease of performing a pendulum-like swing and to provide the user with superior "feel" and increased "touch".

Another object of this invention is to provide the golfer with a means of aligning the putter head with the golf ball with a minimum of effort on his part, allowing his dominant eye to easily follow through from the putter head to the ball on a direct line of sight to the hole.

Another object of the present invention is to provide a golf putter head including a body that is not prone to dragging and which compensates for the uncertainties of the surface upon which the ball rests.

Another object of the present invention is to provide a golf putter including a head having a new shape, overall balance and weight distribution to provide increased influence over the accuracy of a putt, providing a tangible "forgiveness" for the variables imposed by a hostile human factor that interfere with the successful completion of a putt.

Another object of the present invention is to provide a golf putter head including a body having a front face with a series of surface angles to provide improved rebound trajectory including a more desirable over-spin and loft, thus increasing accuracy and distance control.

Another object of the present invention is to provide a golf putter head including a body having a non radial-front face along the horizontal and vertical axes to initiate

overspin, minimizing the outside effects on the ball and forcing it into an early gyroscopic stability, obtaining a better transfer of kinetic energy from the swing to the ball, allowing the user to execute shorter and more compact strokes and providing the user with an enhanced ability to execute more accurate putts.

Another object of the present invention is to provide a golf putter head which compensates for the random changes in dynamics often introduced by those less skilled in the art of putting, thereby enhancing the user's ability to attain preferred results.

Another object of the present invention is to provide a golf putter head that can be milled, machined, cast, forged or molded using one or more of several materials and methods as is typical in the industry.

Various other objects and advantages of the present invention, and its most novel features, will become apparent to those skilled in the art by perusing the accompanying specification, drawings and claims.

It is to be understood that although the invention disclosed herein is fully capable of achieving the objects and providing the advantages described, the characteristics of the invention described in the specification are merely illustrative of a preferred embodiment.

Accordingly, I do not intend that the scope of my exclusive rights and privileges in the invention be limited to the details of the embodiments described. I do intend that equivalents, adaptation and modifications of the invention reasonably inferable from the description contained herein are included within the scope of the invention as defined by the appended claims.

SUMMARY OF THE INVENTION

The present invention is an improved golf putter using a novel combination of shape, balance, weight distribution, to provide a superior "feel" and increased "touch", a more accurate trajectory, and compensation for unfavorable strokes, achieving a new, useful and non-obvious technology which will become apparent to persons skilled in the art upon disclosure of the invention described herein.

The putter head of the preferred embodiment of the present invention has mass concentrated near the shaft at the center of the putter head. In the preferred embodiment, the shaft is inserted into the putter head at its center. Thus, the axis of the putter shaft extends through the center of the putter head, resulting in a static balance where the head of the putter assumes a position vertical to the plane of the ground when the putter is balanced at a point along its shaft. Normally, a statically balanced putter exhibits a tendency to twist or rotate during the pendulum swing. However, in the present invention, the concentration of weight in the center of the putter head along the axis of the shaft effectively limits twist which would result if the weight of the putter head were evenly distributed along the length of the putter head or concentrated in the toe and heel. The putter's balance is laterally extended from the center of mass outwardly to promote a pendulum like swing increasing the chances of the front face remaining parallel with the ground and perpendicular to the target while moving through the putting stroke. The concentration of mass near the shaft also provides for greater feed back up the shaft (i.e. the golfer is better able to feel the impact of the putter head against the ball and consequently control the force used to propel the ball towards the hole.) The head weight is distributed by forming a cavity behind the heel and toe causing the center of gravity of the putter head to rise from the bottom portion of the putter head to the optimum strike area. The sharp angle of the dozed back further positions the weight upward to the center of the putter heads rear to optimize weight distribution directly behind the strike center creating a dense and powerful center of inertia assisting its user to develop a shorter and more compact back and forth stroke to attain superior "feel" and increased "touch" providing for consistent distance control. Positioning the weight increasingly up toward the middle and centering the majority of the mass directly behind the optimum

strike area creates a dense and powerful "sweet spot" providing the user consistent distance control.

The present invention includes a shaft that extends rigidly from a putter head at an angle greater than 10 degrees from the vertical allowing the golfer more freedom to execute the pendulum swing which is more likely to result in a controlled contact with the ball while conforming to tournament rules of play established by the USGA. The putter head is rigidly attached to the shaft to decrease lateral rotation and impart greater control over the speed and direction of the golf ball.

The alignment means of the preferred embodiment of the present invention is a pair of lines on the top surface of the putter head forming a semicircle, the curvature of which corresponds to the circumference of a golf ball. The center of the semicircle is at a point on the top surface directly above the desired strike point, the "sweet spot", extending from the forward edge of the putter head towards the rear of the putter head. The lines may be engraved on or form depressions in the surface of the putter head. The lines may be colored so that they contrast with the color of the putter head itself. The advantage of having circular lines corresponding to the circumference of the golf ball is that they form a frame around the golf ball whereby the golfer may make a quick check of hand positioning while serving as a precise guide for proper sight alignment. The golfer's eye flows naturally from the extended edges of the curved lines to the ball itself much as a cupped catcher's mitt enables the catcher to envision where the ball will land and line up his mitt accordingly.

At either ends of the radius the back forms a line parallel to the face improving the golfer's ability to keep the clubface square throughout impact. The tip ends are flat and square. In a preferred embodiment, the putter head measures 4 ¼ inches in overall length, approximately the same as the diameter of the hole, so that the golfer can more easily see the desired direction of ball travel which must be maintained in order to fell the ball into the hole. The putter head of the preferred embodiment has

with rounded edges on the bottom and the top of the heel and toe portions to reduce snag and snare and to maintain aesthetic uniformity.

The present invention compensates for unfavorable strokes, correcting for under and over striking through the use of a novel striking surface curvature to strike the ball at the preferred 1 degree of loft at the point of contact whether above below or at the equator of the ball. The imparted loft compensates for excessive overspin and helps to avoid driving the ball into the ground.

The present invention imparts a one degree loft and a controllable overspin to the ball, forcing it into an early gyroscopic stability and minimizing outside effects on the ball until, by providing a novel striking surface which impacts the ball at a one degree angle off the perpendicular regardless of where on the striking surface the ball is struck. The striking surface of the preferred embodiment of the present invention is defined by a closed plane curvature generated by a point moving in such a way that the sums of its distances from two fixed points is a constant. The new striking surface of the present invention begins with a 1-degree non-radial contour in the optimum-striking center in the middle of the striking surface. The equivalent of a finite element grid is used in reshaping the striking surface at 1/10 inch increments and recalculating the surface contour to allow its user a 1-degree ball strike when the ball is impacted at any point on its surface. This achieves a non-radial striking face, imitating the positioning at impact of those more practiced in the art of putting further providing an increased "touch" and superior "feel" and is self compensating for the random positioning of the putter head during the swing and at the moment of impact, providing a tangible "forgiveness" for those less skilled in the art of putting.

Thus, if the golfer strikes the ball with the shaft angled forward, angled back from the striking point, or the putter head any distance from the ground, the ball will attain the desired overspin and loft. The present invention compensates for unfavorable strokes, correcting for under and over striking through the use of a novel surface curvature.

A preferred embodiment of the present invention limits the width of the sole across the transverse portion of the putter head. The bottom portion of the head forms a narrow sole to decrease drag and to provide for a smooth juncture between the earth, the grass and the putter. In addition, the sharp edged rearward angle extending rearwardly and upwardly from the sole forms a doze to brush back the taller grass, increasing the odds of making putts launched from less manicured greens or from the fringe areas surrounding the green.

The putting head may be formed by milling, machining, casting, molding or forging using one or more of several materials and methods as is typical in the industry.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the present invention showing non-radial contours on the curved non-radial front striking surface.

FIG. 2 is a side view of the golf putter head of the present invention showing the individual non-radial contours of the curved non-radial front striking surface, the narrow sole and the angle of the doze.

FIG. 3 is a side view of the golf putter head of the present invention in a machined embodiment indicating the changes in angle of the front striking surface when the individual non-radial contours of FIG 2 are smoothed over.

FIG. 4 shows a side view of the putter head of the present invention in an ideal striking position with sole adjacent to the ground.

FIG. 5 shows a side view of the putter head of FIG. 4 in a non-ideal striking position with sole some distance from the ground.

FIG. 6 shows the putter head of FIGS 4 and 5 in a non-ideal striking position with the shaft tilted forward and backward, illustrating impact points above and below the equator of the ball.

FIG. 7 shows a top view of the putter head of FIGS 4, 5and 6 in a non-ideal striking position with the putter head twisted illustrating impact points to the side of the desired direction of travel of the ball.

FIG. 8 is a magnified cross sectional view of the putter head face showing the individual non-radial contours in contact with the ball. The exploded views illustrate the curve resulting from a smoothing of the non-radial contours and the one-degree loft imparted to the ball by any of the non-radial contours at the point of impact.

FIG. 9 is a magnified cross sectional view of the putter head face with the putter raised a distance from the ground as in FIG 5 showing the individual non-radial contours in contact with the ball.

FIG. 10 is a top view of the putter head showing the non-radial curvature and individual non-radial contours along the longitudinal axis of the putter head, the cut out and the alignment means.

FIG.11 is a top view showing the putter head in putting position with relation to the ball and the hole.

FIG. 12 is a top view of the putter head

FIG. 13 is a bottom view of the putter head showing the narrow sole and the doze.

FIG. 14 is a plan view of an embodiment of the putter head striking face where the front surface is milled.

FIG. 15 is a perspective view of FIG. 14.

FIG. 16 is a perspective view of one embodiment of the putter head showing the shaft at the center of the head with an angle suitable for right handed golfers.

FIG. 17 is a perspective view of one embodiment of the putter head showing the shaft at the center of the head with an angle suitable for left handed golfers.

FIG. 18 is a perspective view of one embodiment of the putter head showing the shaft entering the head at an offset from the center with an angle suitable for right handed golfers.

FIG. 19 is a side view showing a face-balanced embodiment of the present invention.

FIG. 20 is a side view showing a static balanced embodiment of the present invention.

FIG. 21 is a perspective view showing an embodiment with the non-radially curved striking face of the present invention on a heel and toe weighted putter.

FIG. 22 is a perspective view showing an embodiment with the non-radially curved striking face of the present invention on a blade putter.

FIG. 23 is a perspective view showing an embodiment with the non-radially curved striking face of the present invention on a mallet putter.

DETAILED DESCRIPTION

Turning now to the detail of the drawings, FIG. 1 shows the front striking face **7** of the present invention putter head **1** with a magnified view showing a sample ½ inch by ½ inch finite element grid **2** and one individual 1/10 inch by 1/10 inch non-radially shaped surface area **3**. Each non-radially shaped surface area **3** is formed by the intersection of the non radial curvature of the surface along the vertical plane (see FIG.2) and the non-radial curvature of the surface along the horizontal plane of the strike face of the putter head (see FIG. 10).

FIG. 2 shows a side view of the putter head of the present invention. This view shows the narrow sole plate **5** and the angle theta of the doze **6**. Theta is a minimum of 10 degrees. The front striking face **7** is characterized by individual non-radial contours **8** recalculated at each 1/10 of an inch along the vertical plane of the front striking face. Each non- radial contour **8** is unique, individually calculated and shaped to provide a one degree loft to a golf ball **9** (See FIGS 4, 5 and 6) at any impact point along the surface of the putter head striking surface **7**.

FIG 3 illustrates the points **26** along the putter head **1** where the recalculations take place. FIG. 8 shows a greatly enlarged cross sectional view of the front striking surface of the putter head striking surface **7** and the golf ball surface **10**. View **A** shows a magnified view of the non-radial surface **11** of an individual non-radial contour **3** in contact with the surface **10** of the golf ball at the moment of impact. At this moment, the non-radial surface **11** imparts a one degree loft (alpha is one degree) to the ball **9**. The dotted line in view **B** of FIG 8 indicates the smoothing of the surface of the putter head **19** along the vertical axis of the front striking surface **7** with the surface being defined by the tangents of each non-radial contour **8**. FIG. 3 illustrates the smooth non-radial surface of the striking face **19** accomplished by machining. FIG 3 shows that the angle of curvature changes at each 1/10 of an inch 26 across the vertical axis of the striking face. FIG 10 shows that the angle of curvature changes at each 1/10 of an inch across horizontal axis of the strike face **7**.

Note that in one embodiment, the strike face appears slightly bowed as shown in FIG. 10.

FIG. 4 shows a side view of the putter head **1** with the shaft **13** and putter head **1** held perpendicularly to the ground with the sole **4** adjacent to the ground. In this ideal putting position, the front striking surface **7** will intersect the ball **9** at the equator of the golf ball **14**, imparting an over-spin and one degree loft to the ball **9**, propelling the ball **9** in a direction of travel **15** towards the hole **16**. FIG 4 shows the ideal putting position attainable only after much practice and by only a very few golfers. The more likely scenario is shown in FIG 5. The putter head **1** is held some unknown distance off the ground **17**. The front striking surface **7** impacts the surface of the ball **9** at an unknown point on the surface of the putter striking face. With other putters known and used in the sport of golf, the variability of distance **17** would create uncertainty as to where the impact point with the ball **9** would be and result in an unpredictable over-spin and/or loft to the ball **9**. The striking surface **7** of the present invention will impart a one-degree loft and overspin to the ball **9** regardless of where on the striking surface the ball is impacted. Distance **17** may be any length consistent with actually striking the ball. Since it takes many years of practice to repeatably hit the ball with the putter head a predictable distance from the ground, the present invention provides for a great deal of forgiveness in the swing. Further, the inexperienced golfer is much more likely to hit the ball with the shaft **13** at a non-perpendicular angle from the direction of travel **15** as shown in FIG 6 resulting in the ball being propelled forward with an undesirable loft (rearward angle) or an undesirable skidding and bounce (foreward angle). Further complicating the task of propelling the ball **9** forward is that the novice golfer will tend to twist even the most well balanced putter as shown in FIG 7. The recalculation of the non-radial curvature of the striking surface **7** along the horizontal axis of the putter head **1** results in a non-radial curvature which is forgiving to the twist **18.**

FIG 10 is a top view of the putter head **7** showing the cutout **19** of the back surface **21** which tends to concentrate mass of the putter head at the entrance point **20** of the

shaft. **13**. The center of mass is further concentrated upwardly from the bottom of the putter head by the cut of the doze **6** as seen in FIGS 2, 3, 4 and 5.

FIG. 10 also shows the alignment means **22** where the curvature of the lines **22** may be engraved into the top surface of the putter head, painted or otherwise applied in a contrasting color to the surface of the putter head. The diameter of the of the circle defined by the curvature of the lines **22** is approximately the same as the diameter of a golf ball **9** as shown in FIG 11.

In the preferred embodiment, the width of the putter head **1** is approximately the same as the diameter of the hole **16** in which the ball is to be sunk. This feature further enables the golfer to envision the path the ball must travel and to align the putter head **1** with the hole **16** to determine the correct direction of travel for the ball **9** as shown in FIG 11.

FIG.12 shows a top view similar to FIG. 10. Note that the angle and resultant thickening of the mass at the center point of the putter head **23** concentrates the center of mass near the entry point of the shaft. FIG.13 shows a view of the bottom portion of the putter head **1** showing the narrow sole **4**., the front striking face **7** and the doze **6**. Note the curved outline **23** revealing a shape designed to concentrate mass at the center of the putter head **1** and away from the sole plate **4**.

FIGS. 14 and 15 are respectively plan and perspective views of the striking face **7** of the present invention showing a radius of curvature along the vertical axis of the front striking face **7** where the surface has been milled smooth. It can be appreciated that the manufacture of the putter head in metallic form such as brass and the like require that the putter head surface vertical curvature extend across the face horizontally. Thus the curvature of the front striking surface **7** as shown in FIG 10 may not appear in such an embodiment.